

N62604.AR.001807
NCBC GULFPORT
5090.3a

LETTER REGARDING DELISTING OF PROCESS ASH FROM SITE 8 WITH ATTACHMENTS
NCBC GULFPORT MS
6/3/1988
IDAHO NATIONAL ENGINEERING LABORATORY



39501-SITE 8 INCINERATION

19.02.08.0003

D. J. Haley Ltr F

June 3, 1988

Maj. T. L. Stoddart
HQ AFESC/RDVW
Building 1117
Tyndall AFB, FL 32403

R.2.8.3

CONCERNS ON FUTURE OF DELISTING FOR NCBC PROCESS ASH DJH-13-88

Dear Maj. Stoddart:

Over the past several weeks, analytical results and numerous discussions between the Air Force, EG&G, and Versar have indicated that significant difficulties will be encountered if we attempt to delist the NCBC process ash. These problems arise exclusively from EPA's usage of the VHS and OLM models. Those models set a delisting criteria that is directly dependent upon the pseudo drinking water standard of 0.2 ppq (based upon the CAG dioxin potency factor) and is inversely dependent upon the volume of the soil to be delisted. Due to the large volume of soil that we need to delist, our delisting criteria is the lowest possible, namely 0.42 ppt of total equivalent dioxins and furans. This level was calculated using the VHS and OLM models and is nearly identical to previous calculations performed by Mr. D. B. Derrington. Attachment 1 shows those calculations.

The 0.42 ppt in soil is slightly below the High Resolution GC/MS analytical Method Detection Limit (MDL) which is typically 1.0 to 5.0 ppt. The EPA Office of Solid Waste has recognized that the delisting criteria is below the MDL, hence they have promulgated the concept of a Practical Quantitating Limit (PQL). A PQL is defined by the EPA as three times the Method Detection Limit using analytical method 8290 for High Resolution GC/MS where the MDL is 2.5 times the background GC/MS noise. Because the MDL is approximately 5.0 ppt, EPA has set the PQL at 15 ppt for tetra and penta dioxin/furan and 37 ppt for hexa-dioxin/furan (Reference Federal Register March 11, 1988, page 7911).

The factor of three for the PQL was developed by the EPA in an effort to reduce the possibility of denying delisting based upon a "false positive." In a study of several laboratories using method 8290 on real world samples, EPA found that if the "true" concentration was at the MDL, then one has a 50% chance of accurately quantifying it. Therefore, using a statistical approach, EPA determined that if a sample is shown to be above the PQL of 15 ppt, for example, then one can be quite certain (presumably > 95% confident) that dioxin does indeed reside in the sample

Maj. Stoddart
June 3, 1988
DJH-13-88
Page 2

and thus should be considered hazardous. If the sample concentration is detected below the PQL or not detected at a MDL, which is below the PQL, then EPA will consider the sample to be a non-detect, i.e., a zero concentration.

Attachment 2 is an internal EPA memorandum describing how a PQL of 10 ppt was derived. In response to public comment, EPA raised the PQL to 15 ppt. The attached letter was obtained by D. B. Derrington from the public docket to the aforementioned federal register notice that granted delisting for the Syntax still bottoms process ash. A conversation between myself, Dr. W. A. Bauer, EG&G Chemical Sciences, and Mr. R. Booth, EPA EMS Laboratory, on May 24, 1988, confirmed that the MDL used by EPA was 2.5 times the background noise.

The MDL for Twin Cities Testing is more conservative than the MDL from IT Analytical Services. The MDL from IT is 2.5 times the background noise. Although EPA has stated that PQLs are dependent upon the waste matrix and "will be determined, as needed, on a case by case basis," I believe that the NCBC process ash is similar to the Syntax ash and the samples that were used to determine the referenced PQL; thus we can assume that the 15 ppt PQL will apply to the NCBC ash as well.

Table 1 is a compilation of the High Resolution GC/MS analytical results for dioxins and furans received to date. Table 2 shows the calculated TCDD equivalent, which is based upon the multipliers presented in the January 4, 1988, Federal Register (page 38). The multipliers and an example calculation are presented in Attachment 3. The tables show that only three samples do not support delisting, based upon the PQL concept and the 0.42 ppt delisting limit. Sample SBJH121687 was obtained by the EPA subcontractor whose quality control was not monitored by us; therefore, that sample may have been cross contaminated and thus, could be discredited in the delisting petition. Samples SBRC0041488 and SJSH042888 do not meet the delisting criteria because of relatively high concentrations of HxCDD. The analysis was done by IT who did not separate the 2378 substituted isomers from the total HxCDD. By separating the 2378 substituted isomers from the non-2378 isomers, we would be able to use a lower equivalent factor for the non-2378 isomers; thus the calculated total TCDD equivalent value could meet the delisting criteria.

A sister sample of SJSH042888 was analyzed by Twin Cities Testing. That sample, SJ0042888-TC, was analyzed for the 2378 substituted isomers and none were detected. Therefore, the sister sample indicates that the sample is delistable. Arguing that the second sample is more representative of reality is possible because EPA has stated that "the petitioner can request that the laboratory reanalyze the residues to achieve the PQL specified in the exclusion or the petitioner can retain

Maj. T. L. Stoddart
June 3, 1988
DJH-13-88
Page 3

the services of a different laboratory that is capable of achieving the PQLs." Therefore, the only sample that does not support delisting is SJSH042888.

I have contacted IT and asked them to re-examine the chromatograms for the three samples in question to determine if the 2378 substituted HxCDD can be quantified. I am expecting verbal results by June 6. Additionally, I will have samples SBCH021688 and SRC0041488 re-analyzed at Twin Cities Testing. I will keep you apprised of the results as they become available.

It is imperative to understand that as long as EPA continues to use the VHS/OLM models in conjunction with the 0.2ppq pseudo drinking water standard, then the continued use of a 15 ppt PQL is the only chance that the NCBC process ash can be delisted.

The primary questions before us are: a) how did the EPA Release Control Branch delist their dioxin incineration process ash; b) what can we do to improve our chances of delisting; and c) what are the options for disposition of the process ash? Each item is discussed below.

A. Previous Delisting Petitions

On June 5, 1985, a delisting petition was submitted by the EPA Release Control Branch (RCB) for the Denny Farm Missouri Site. That petition was for delisting process ash resulting from incineration of soils contaminated with TCDD at concentrations not unlike those at NCBC. RCB was granted delisting on July 25, 1985. No TCDD contamination was found in their process ash with a detection limit of 90 ppt; however a "research" method was also used and TCDD was found in the range of 0.7 ppt to 2.9 ppt. Presumably, the "research" method is similar to what is now described as Method 8290 for High Resolution GC/MS analysis which is the same methodology use by our two laboratories.

RCB was granted delisting prior to the November 13, 1986, promulgation of the Organic Leachate Model (OLM) If RCB had been required to use the OLM model, without the benefit of the 15 ppt PQL concept, they too would be denied delisting!

On January 4, 1988, RCB submitted a delisting petition for the process ash resulting from incineration of Syntax still bottoms. EPA OSW set the delisting criteria at 5.0 ppt based upon the VHS/OLM model and a pseudo drinking water standard of 0.2 ppq TCDD. The Syntax petition has a higher allowable level than the one that will be used at NCBC because the volume of ash is only 475 cubic yards. At NCBC the volume of waste will be approximately 11,000 cubic yards.

B. Alternatives to Improve Delisting Chances

- *Eliminate the Contamination Source*

As you are aware, a cooperative effort between EG&G, the Air Force, ENSCO, and Versar has been ongoing in order to determine and eliminate the source of the dioxins. Although those efforts have reduced the dioxin contamination, they have not eliminated it; hence, we are still getting positive detections in both the ash drag and the kiln solids sample. The kiln solids samples are taken directly from the exit of the kiln before the processed soil falls into the ash drag. This sampling point is intended to reduce the possibility of dioxin cross contamination. Because we have found contamination in both the kiln solids and the ash drag, we are examining both the sampling techniques and the kiln operation. Per your request, we are developing a test plan that when implemented will vary the key kiln operating parameters while obtaining ash samples. This test is an effort to determine which operating conditions produce the ash with the lowest residual dioxin contamination. The details of the test plan are currently being developed.

The proposed test series has certain advantages and disadvantages. Emphasizing the research aspects of this project is the main advantage. Through this test, we may be able to determine the optimum kiln conditions which could be used on future Air Force projects. Because we have already processed nearly half of the total volume of waste, the data obtained will not contribute significantly to the NCBC delisting effort. However, the data will help future delisting efforts if the Air Force chooses to use thermal technology at another dioxin site. Those data will be especially useful if EPA changes the dioxin delisting criteria again.

The main disadvantage lies primarily in the cost. We expect to run approximately 20 tests and each test will require at least two ash samples (kiln solids and ash drag). At a cost of \$1700 per sample, the analytical costs alone could reach \$68,000. Additionally, the costs associated with development of a test plan, additional fuel, additional labor, travel, etc., must be considered. Although this letter is not intended to serve as a cost estimate, I believe that the total cost of the test could reach \$130,000.

Additionally, the data obtained from these tests may be of questionable scientific value. Because the dioxin concentrations are currently near the detection limits, any improvement in the ash quality may not be detected or may be statistically insignificant. We are currently assessing the potential usefulness of the data to be collected and will brief you before the tests are initiated.

Maj. T. L. Stoddart
June 3, 1988
DJH-13-88
Page 5

- *Check for Laboratory Contamination*

Recently, we began using Twin Cities Testing Laboratories in St. Paul Minnesota. As mentioned previously, one on ash drag sample (SJ0042888) they obtained non detects for TCDF, HxCDD, and HpCDD at low detection limits; a sister sample (SJSH042888) analyzed by IT Corp. showed a positive detections for those constituents. Thus, it is possible that the source of contamination is the IT Analytical Services Laboratory. We are currently assessing the discrepancy, and are focusing our attention upon sample homogeneity, and analytical procedural differences. If we can determine that the Twin Cities results are "truer" than IT's results, then we may have a better chance of delisting the process ash under the current EPA delisting rules.

Due to the extremely low levels of dioxin in the sample, however, it may be impossible to convincingly state that one analytical result is "truer" than another. Therefore, we may never be able to fully resolve the discrepancy unless numerous duplicate analyses are performed. We will keep you apprised of any developments.

- *Use TCLP Data*

We have discussed the possibility of using the TCLP data in addition to or in lieu of the Total Weight Analysis (TWA). This is a logical choice because the TCLP value is the theoretical leachate concentration that would enter the aquifer and is theoretically represented by C_0 in the VHS model. Because our TCLP values have not shown any dioxins (detection limit 0.7 ppt), then one could logically assume that zero could be entered into the model for C_0 and thus the concentration at the compliance point, C_y , based upon the VHS model would also show zero and the waste would be delistable.

Unfortunately, logic does not prevail. EPA has specifically ruled out the use of TCLP data in the VHS model. When the Organic Leachate Model was promulgated on November 13, 1986, EPA responded to a commenter that suggested using TCLP data in lieu of the OLM. The commenter suggested that the OLM was redundant with TCLP data because the OLM was developed from TCLP data. Presumably, the commenter believed that TCLP data represented reality better than the OLM. EPA responded:

"...the Agency intends to replace the OLM with a viable leaching test when such a test is adopted in the delisting program. Until then the Agency believes that the empirical OLM is an acceptable method of petition evaluation. EPA reminds the commander that lysimeter data were included in the regression analysis [that were used to develop the OLM] as well as a number of different leaching media."

Maj. T. L. Stoddart
June 3, 1988
DJH-13-88
Page 6

EPA further emphasized that:

"The agency will not consider the results of the TCLP in evaluating delisting petitions until we conclude that it would be appropriate for delisting."

This position was reiterated as recently as March 11, 1988, in the Federal Register when the Syntax still bottoms ash residual was delisted. EPA specifically required the petitioner to use the proposed analytical method 8290, i.e., High Resolution Gas Chromatography/High Resolution Mass Spectrometry Total Weight Analysis.

Furthermore, in a letter from M. Morris to D. B. Derrington on December 12, 1986, Mr. Morris said:

"While you will be required to conduct TCLP analysis of the residue for dioxin in conjunction with the land disposal restriction (see 51 FR 40615, November 7, 1986) a dioxin leachate level below the treatment standard will not demonstrate that the waste is nonhazardous for delisting purposes. The waste will still be subject to the OLM/VHS analysis."

At the time Mr. Morris requested that we perform TCLP analysis on the process ash, he apparently assumed that TCLP would be promulgated shortly. TCLP has not been required for any other dioxin delisting petitions; therefore, I believe that it will not be required for the NCBC delisting petition (assuming that we submit the petition in 1988). Nevertheless, we had two ash samples analyzed using the TCLP extraction procedure with Hi Res GC/MS. As expected, no detectable dioxins were present in the extractant at a detection level of 0.025 ppt. The results are shown in Table 1. I recommend that we perform at least two more TCLP analysis on process ash samples as an insurance policy in the event that EPA requests them. More than four total TCLP samples would not be cost effective.

Recently when I was at the EPA Research symposium in Cincinnati, I heard a rumor that EPA will promulgate the TCLP test in June or July. However, when I called the RCRA Hotline on May 16, EPA said that they are thinking about re-proposing the TCLP test in the Federal Register because they have had so many comments on it. To further confuse the issue, a recent news item in the *Hazardous Waste Report* newsletter indicates that EPA is considering an entirely new leaching tests. Thus it does not look like TCLP will be adopted anytime in the near future and we ought not count on TCLP data to contribute to the delisting cause.

C. Process Ash Disposition Options

The Air Force has three fundamental options: 1) submit a delisting petition with the belief that delisting will legitimately be granted under the existing rules; 2) submit a delisting petition with the knowledge that you will probably fail; and 3) do nothing until the EPA changes the delisting rules again.

1. Given the current delisting rules, i.e., the usage of the VHS/OLM and the PQL, I believe that we have a chance of delisting the process ash for NCBC. I must emphasize, however, that the only glimmer of hope comes from the PQL concept, without it we cannot delist because our analytical results are substantially above the 0.42 ppt. limit set by the VHS/OLM. This option has the advantage of knowing what to expect, i.e., we submit the petition, EPA grants delisting, we backfill the process ash and finish the project. The disadvantage of this option is that it capitulates to EPA and allows the existing standards to continue to be applied to any future dioxin cleanup projects that the Air Force undertakes.
2. As additional data are analyzed, we may become less optimistic about delisting. If delisting appears to be improbable, I recommend that we submit a petition that includes arguments against the VHS/OLM model, EPA denial of the usage of TCLP data, or the usage of the 0.2 ppq drinking water standard, etc. These additional arguments will certainly be grounds for EPA to deny delisting, however, denial on those grounds will become the stepping stone for legal action against EPA.

If delisting is denied, based upon the existing rules, I strongly recommend that the Air Force pursue legal action against the EPA. I am sure that you agree that the dioxin delisting rules are capricious, and unwarranted. Strong legal and technical arguments could be made against the EPA's policy and scientific reasoning. Although the legal option would be costly in terms of time, it would be less costly than capitulating to the EPA by disposing the waste in a Subtitle C landfill, if one were available. If the need arises, we can assist in the development of technical arguments for any legal action.

3. Not submitting a delisting petition is an option that has potentially serious political impacts. For several years, we have been assuring EPA headquarters and Region IV, that we would submit a petition. If we did not submit, then what little trust

Maj. T. L. Stoddart
June 3, 1988
DJH-13-88
Page 8

and cooperation that we are receiving from EPA could be lost for this and future projects. Additionally, I believe that EPA would probably take some sort of legal action against us. If we do not submit a petition, then we must have a sound well prepared justification.

By submitting a draft petition to Region IV, we could maintain our working relationship with them while awaiting any desired rule changes from the EPA OSW. Receiving comments from Region IV or awaiting any rule changes would likely consume several months. Submitting a draft petition to Region IV at this time may draw unneeded attention to the delistability of the process ash.

Summary

In conclusion, I believe that we have a chance of being granted delisting, based solely upon the usage of the 15 ppt PQL. If the PQL is lowered or its use is denied for unknown reasons in the future, then we cannot delist. Furthermore, there is no possibility whatsoever of using TCLP data in lieu of total weight high resolution analysis. If delisting is denied, then I believe that the Air Force could present substantial arguments against the EPA in a legal forum that would ultimately result in delisting. Although legal action against EPA would be costly, the alternative of landfilling the process ash would be more costly and precedent setting for any future dioxin disposal projects.

If you have any questions, please call me at (208) 526-9959.

Very truly yours,



Daniel J. Haley
Sr. Programs Specialist
Hazardous Waste Projects

Attachments
As Stated

cc: J. Lanier, ENSCO
J. J. Short, USAF
D. B. Derrington, Versar
J. H. Nelson (w/o attach)
J. O. Zane (w/o attach)

TABLE 1

		DIOXINS (PARTS PER BILLION UNLESS INDICATED BY \$)						
SAMPLE NUMBER	DESCRIPTION	CALCULATED						
		2378 TCDD	TCDD	NON 2378 TCDD	PeCDD	HxCDD	HpCDD	OCDD
AVG VERIFICATION (SEE FOOTNOTES)		ND @ 0.0023 +	ND @ 0.0040 +	0	ND @ 0.0014 +	ND @ 0.00198 +	0.00063	0.0121
VERIFICATION 1		ND @ 0.0011	ND @ 0.0048	0	ND @ 0.00180	ND @ 0.00540	ND @ 0.00045 \$	0.0024
VERIFICATION 2		ND @ 0.0044	ND @ 0.0015	0	ND @ 0.0029	ND @ 0.00140	0.00039	0.00437
VERIFICATION 3		ND @ 0.0017	ND @ 0.0089	0	ND @ 0.00028	ND @ 0.00220	ND @ 0.0017 \$	0.0193
VERIFICATION 5		ND @ 0.0026	ND @ 0.0022	0	ND @ 0.00035	ND @ 0.00014	0.00058	0.0227
VERIFICATION 6		ND @ 0.0018	ND @ 0.0025	0	ND @ 0.00150	ND @ 0.00076	0.00092	0.0116
SBCH121687A	DEC. ENSCO COLLECTED	0.010	0.0099	0	ND @ 0.0017	ND @ 0.014	ND @ 0.0091	0.031
SBJH121687A	DEC. EPA COLLECTED	0.2	0.16	0	ND @ 0.0016	0.012	ND @ 0.016	0.16
SBCH011688A	JAN.	ND @ 0.013	ND @ 0.0079	0	ND @ 0.0019	0.0032	ND @ 0.0010	0.044
SBCH021688	FEB.	ND @ 0.014	0.0049	0.0049	0.0039	0.048	0.01	0.058
SBCH031688	MAR.	ND @ 0.010	ND @ 0.0056	0	ND @ 0.0040	0.0094	ND @ 0.0034	ND @ 0.013
SSBD041488	EARLY DEC. COMPOSITE	ND @ 0.0071	0.0068	0.0068	0.0084	0.02	ND @ 0.0053	ND @ 0.010
SSAD041488	LATE DEC. COMPOSITE	ND @ 0.0039	0.0035	0.0035	0.0046	ND @ 0.020	ND @ 0.0057	ND @ 0.012
SSBF041488	EARLY FEB. COMPOSITE	ND @ 0.0049	0.0028	0.0028	0.0026	0.015	ND @ 0.010	ND @ 0.014
SSAF041488	LATE FEB. COMPOSITE	ND @ 0.0046	0.0064	0.0064	0.011	0.017	ND @ 0.0046	ND @ 0.0053
SJSH041488	APRIL 14	ND @ 0.0074	0.004	0.004	0.0072	0.024	ND @ 0.0060	ND @ 0.024
SJTC011488	APRIL 14 TCLP	ND @ 0.066 \$	ND @ 0.025 \$	0	ND @ 0.022 \$	ND @ 0.016 \$	ND @ 0.071 \$	ND @ 0.24 \$
SJSH042188	APRIL 21		ND @ 0.0020	0	ND @ 0.0029	0.029	0.14	0.64
SJTC042188	APRIL 21 TCLP		ND @ 0.028 \$	0	ND @ 0.012 \$	ND @ 0.0075 \$	ND @ 0.061 \$	0.5
SRCD041488	APRIL 14 KILN SOLIDS	ND @ 0.0041	ND @ 0.0024	0	ND @ 0.0021	0.056	ND @ 0.011	0.13
SJSH042888	APRIL 28 ASH DRAG	ND @ 0.030	ND @ 0.0074	0	ND @ 0.0042	0.038	0.042	0.28
WCD041488	APRIL 14 A.D. WATER	ND @ 0.000071	ND @ 0.000054	0	ND @ 0.000027	ND @ 0.00015	ND @ 0.000056	ND @ 0.00014
FBCLO41488	APRIL 14 FEEDSTOCK	15.9	16.0	0.1	ND @ 0.066	ND @ 0.013	ND @ 0.015	0.66
SUSH051388-TC	CYCLONE DOWNCOMMER	ND @ 0.0017	ND @ 0.0017	0	ND @ 0.0042	ND @ 0.0086	ND @ 0.025	ND @ 0.032
SJSH051388-TC	MAY 13	ND @ 0.0045	0.006	0.006	ND @ 0.0031	ND @ 0.0098	ND @ 0.023	ND @ 0.022
SRSH051388-TC	KILN SOLIDS MAY 13	ND @ 0.0016	ND @ 0.0016	0	ND @ 0.0056	ND @ 0.007	ND @ 0.020	ND @ 0.034
SJ0042888-TC	APRIL 28 ASH DRAG	ND @ 0.0012	ND @ 0.0012	0	ND @ 0.0039	ND @ 0.0074	ND @ 0.021	ND @ 0.050
SRC0042188-TC	KILN SOLIDS APRIL 21	ND @ 0.0017	ND @ 0.0017	0	ND @ 0.004	ND @ 0.0094	ND @ 0.027	ND @ 0.080
SRC0042888-TC	KILN SOLIDS APRIL 28	ND @ 0.001	ND @ 0.001	0	ND @ 0.0037	ND @ 0.0084	ND @ 0.013	ND @ 0.038
WCD00421TC-TC	A.D. WATER APRIL 21	ND @ 0.00005	ND @ 0.00005	0	ND @ 0.0002	ND @ 0.0008	ND @ 0.0011	0.0027
WCD04288TC-TC	A.D. WATER APRIL 28	ND @ 0.00003	ND @ 0.00003	0	ND @ 0.00008	ND @ 0.0003	ND @ 0.0011	ND @ 0.012
WCD04288TC-DUPLICATE		ND @ 0.00001	ND @ 0.00001	0	ND @ 0.0001	ND @ 0.00008	ND @ 0.00032	ND @ 0.0013
WCD051388-TC	A.D. WATER MAY 13	ND @ 0.00005	ND @ 0.00005	0	ND @ 0.00006	ND @ 0.00017	ND @ 0.00041	ND @ 0.00064

*FOOTNOTES:

+ INDICATES AVG OF THE NON DETECT VALUES

\$ UNITS IN PARTS PER TRILLION (PPT)

\$\$ ND VALUE NOT INCLUDED IN AVERAGE

TABLE 1 (CONTINUED)

		FURANS (PARTS PER BILLION UNLESS INDICATED BY #)								
SAMPLE NUMBER	DESCRIPTION	CALCULATED						TOTAL TCDD EQUIVALENT	PPT FROM TABLE 2	
		2378 TCDF	TCDF	NON 2378 TCDF	PeCDF	HxCDF	HpCDF			
AVG VERIFICATION (SEE FOOTNOTES)		0.0041	0.0116	0.00755	ND @ 0.0007 +	ND @ 0.00054	ND @ 0.001 +	ND @ 0.0028 +	0.00	
VERIFICATION 1		ND @ 0.00220 #	ND @ 0.00085 #	0	ND @ 0.00018	ND @ 0.00031	ND @ 0.00110	ND @ 0.0024	0.00	
VERIFICATION 2		0.0049	0.0129	0.008	ND @ 0.00069	ND @ 0.00057	ND @ 0.00062	ND @ 0.0012	0.00	
VERIFICATION 3		0.0054	0.016	0.0106	ND @ 0.00129	ND @ 0.00068	ND @ 0.00050	ND @ 0.0027	0.00	
VERIFICATION 5		0.0021	0.0067	0.0046	ND @ 0.00048	ND @ 0.00065	0.0065	ND @ 0.0028	0.00	
VERIFICATION 6		0.0038	0.0108	0.007	ND @ 0.00089	ND @ 0.00053	ND @ 0.00190	ND @ 0.0023	0.00	
SBCH121687A	DEC. ENSCO COLLECTED	ND @ 0.0058	ND @ 0.0040	0	ND @ 0.0019	ND @ 0.0039	ND @ 0.0044	ND @ 0.0092	0.00	
SBJH121687A	DEC. EPA COLLECTED	ND @ 0.0088	ND @ 0.010	0	ND @ 0.0060	ND @ 0.0071	ND @ 0.011	ND @ 0.018	200.00 #	
SBCH011688A	JAN.	ND @ 0.011	ND @ 0.0074	0	ND @ 0.0010	ND @ 0.0015	ND @ 0.0054	ND @ 0.0017	0.00	
SBCH021688	FEB.	ND @ 0.013	0.066	0.066	0.0037	0.004	0.0074	0.011	1.99 #	
SBCH031688	MAR.	ND @ 0.010	0.0035	0.0035	ND @ 0.0017	ND @ 0.0014	ND @ 0.0024	ND @ 0.0017	0.00	
SSBD041488	EARLY DEC. COMPOSITE	ND @ 0.0039	0.004	0.004	ND @ 0.0011	ND @ 0.0018	ND @ 0.0026	ND @ 0.0042	0.00	
SSAD041488	LATE DEC. COMPOSITE	ND @ 0.0060	0.0021	0.0021	ND @ 0.0020	ND @ 0.0019	ND @ 0.0012	ND @ 0.0054	0.00	
SSBF041488	EARLY FEB. COMPOSITE	ND @ 0.0089	0.0022	0.0022	ND @ 0.00063	ND @ 0.0017	ND @ 0.0012	ND @ 0.0023	0.00	
SSAF041488	LATE FEB. COMPOSITE	ND @ 0.0052	0.00089	0.00089	ND @ 0.00098	ND @ 0.00069	ND @ 0.0023	ND @ 0.0033	0.00	
SJSH041488	APRIL 14	ND @ 0.0057	0.008	0.008	ND @ 0.0032	ND @ 0.0040	ND @ 0.0058	ND @ 0.0022	0.00	
SJTC011488	APRIL 14 TCLP	ND @ 0.042 #	ND @ 0.022 #	0	ND @ 0.0075 #	ND @ 0.015 #	ND @ 0.0082 #	ND @ 0.10 #	0.00	
SJSH042188	APRIL 21		0.0036	0.0036	ND @ 0.0029	0.016	0.037	ND @ 0.018	0.00	
SJTC042188	APRIL 21 TCLP		ND @ 0.021 #	0	ND @ 0.0078 #	ND @ 0.016 #	ND @ 0.032 #	ND @ 0.10 #	0.00	
SRCD041488	APRIL 14 KILN SOLIDS	ND @ 0.010	ND @ 0.0045	0	ND @ 0.0037	ND @ 0.0034	ND @ 0.0025	ND @ 0.0030	2.24 #	
SJSH042888	APRIL 28 ASH DRAG	0.0046	0.0046	0	ND @ 0.0012	ND @ 0.0012	ND @ 0.0045	ND @ 0.0053	1.52 #	
WCD041488	APRIL 14 A.D. WATER	ND @ 0.000056	ND @ 0.000045	0	ND @ 0.000031	ND @ 0.000023	ND @ 0.000017	ND @ 0.000024	0.00	
FBCL041488	APRIL 14 FEEDSTOCK	ND @ 0.17	0.60	0.6	0.57	ND @ 0.035	ND @ 0.047	ND @ 0.1	15958.60 #	
SUSH051388-TC	CYCLONE DOWNCOMMER	ND @ 0.0019	ND @ 0.0019	0	ND @ 0.003	ND @ 0.0072	ND @ 0.012	ND @ 0.028	0.00	
SJSH051388-TC	MAY 13	ND @ 0.0021	ND @ 0.0021	0	ND @ 0.0027	ND @ 0.0058	ND @ 0.011	ND @ 0.026	0.00	
SRSH051388-TC	KILN SOLIDS MAY 13	ND @ 0.0016	ND @ 0.0016	0	ND @ 0.0034	ND @ 0.006	ND @ 0.015	ND @ 0.025	0.00	
SJ0042888-TC	APRIL 28 ASH DRAG	ND @ 0.0007	ND @ 0.0007	0	ND @ 0.0028	ND @ 0.0069	ND @ 0.017	ND @ 0.043	0.00	
SRCD042188-TC	KILN SOLIDS APRIL 21	ND @ 0.0011	ND @ 0.0011	0	ND @ 0.0036	ND @ 0.011	ND @ 0.023	ND @ 0.071	0.00	
SRCD042888-TC	KILN SOLIDS APRIL 28	ND @ 0.0008	ND @ 0.0008	0	ND @ 0.0026	ND @ 0.0066	ND @ 0.010	ND @ 0.050	0.00	
WCD00421TC-TC	A.D. WATER APRIL 21	ND @ 0.00003	ND @ 0.00003	0	ND @ 0.0001	ND @ 0.001	ND @ 0.0015	ND @ 0.0032	0.00	
WCD04288TC-TC	A.D. WATER APRIL 28	ND @ 0.00002	ND @ 0.00002	0	ND @ 0.00006	ND @ 0.0005	ND @ 0.0008	ND @ 0.0059	0.00	
WCD04288TC-DUPLICATE									0.00	
WCD051388-TC	A.D. WATER MAY 13	ND @ 0.00005	ND @ 0.00006	0	ND @ 0.00005	ND @ 0.00007	ND @ 0.00020	ND @ 0.00052	0.00	

INDICATES
0.42 ppt
EXCEEDED

TABLE 2

PBL		TABLE 2						
0.015 =FOR TCDD/F & PeCDD/F		DIOXIN EQUIVALENT CALCULATIONS (PARTS PER BILLION UNLESS INDICATED BY %)						
0.037 =FOR HxCDD/F								
SAMPLE NUMBER	DESCRIPTION	CALCULATED						
		2378 TCDD	TCDD	PeCDD	HxCDD	HpCDD	OCDD	
DIOXIN EQUIVALENT FACTOR		1.0	0.01	0.5	0.04	0	0	
=====								
AVG VERIFICATION (SEE FOOTNOTES)		0	0	0	0			
VERIFICATION 1		0	0	0	0			
VERIFICATION 2		0	0	0	0			
VERIFICATION 3		0	0	0	0			
VERIFICATION 5		0	0	0	0			
VERIFICATION 6		0	0	0	0			
=====								
SBCH121687A	DEC. ENSCO COLLECTED	0	0	0	0			
SBJH121687A	DEC. EPA COLLECTED	0.2	0	0	0			
SBCH011688A	JAN.	0	0	0	0			
SBCH021688	FEB.	0	0	0	0.00192			
SBCH031688	MAR.	0	0	0	0			
SSBD041488	EARLY DEC. COMPOSITE	0	0	0	0			
SSAD041488	LATE DEC. COMPOSITE	0	0	0	0			
SSBF041488	EARLY FEB. COMPOSITE	0	0	0	0			
SSAF041488	LATE FEB. COMPOSITE	0	0	0	0			
SJSH041488	APRIL 14	0	0	0	0			
SJTC011488	APRIL 14 TCLP	0	0	0	0			
SJSH042188	APRIL 21	0	0	0	0			
SJTC042188	APRIL 21 TCLP	0	0	0	0			
SRCD041488	APRIL 14 KILN SOLIDS	0	0	0	0.00224			
SJSH042888	APRIL 28 ASH DRAG	0	0	0	0.00152			
WCD041488	APRIL 14 A.D. WATER	0	0	0	0			
FBCL041488	APRIL 14 FEEDSTOCK	15.9	0.001	0	0			
SUSH051388-TC	CYCLONE DOWNCOMMER	0	0	0	0			
SJSH051388-TC	MAY 13	0	0	0	0			
SRSH051388-TC	KILN SOLIDS MAY 13	0	0	0	0			
SJD042888-TC	APRIL 28 ASH DRAG	0	0	0	0			
SRCD042188-TC	KILN SOLIDS APRIL 21	0	0	0	0			
SRCD042888-TC	KILN SOLIDS APRIL 28	0	0	0	0			
WCD00421TC-TC	A.D. WATER APRIL 21	0	0	0	0			
WCD04288TC-TC	A.D. WATER APRIL 28	0	0	0	0			
WCD04288TC-DUPLICATE		0	0	0	0			
WCD051388-TC	A.D. WATER MAY 13	0	0	0	0			

PBL

TABLE 2 (CONTINUED)

0.015 =FOR TCDD/F & PeCDD/F

0.037 =FOR HxCDD/F

FURANS (PARTS PER BILLION UNLESS INDICATED BY \$)

SAMPLE NUMBER	DESCRIPTION	DIOXIN EQUIVALENT FACTOR	CALCULATED NON 2378						TOTAL TCDD EQUIVALENT PPT
			2378 TCDF	TCDF	PeCDF	HxCDF	HpCDF	OCDF	
			0.01	0.001	0.1	0.01	0	0	
AVG VERIFICATION (SEE FOOTNOTES)			0	0	0	0			0.00
VERIFICATION 1			0	0	0	0			0.00
VERIFICATION 2			0	0	0	0			0.00
VERIFICATION 3			0	0	0	0			0.00
VERIFICATION 5			0	0	0	0			0.00
VERIFICATION 6			0	0	0	0			0.00
SBCH121687A	DEC. ENSCO COLLECTED		0	0	0	0			0.00
SBJH121687A	DEC. EPA COLLECTED		0	0	0	0			200.00 #
SBCH011688A	JAN.		0	0	0	0			0.00
SBCH021688	FEB.		0	0.000066	0	0			1.99 #
SBCH031688	MAR.		0	0	0	0			0.00
SSBD041488	EARLY DEC. COMPOSITE		0	0	0	0			0.00
SSAD041488	LATE DEC. COMPOSITE		0	0	0	0			0.00
SSBF041488	EARLY FEB. COMPOSITE		0	0	0	0			0.00
SSAF041488	LATE FEB. COMPOSITE		0	0	0	0			0.00
SJSH041488	APRIL 14		0	0	0	0			0.00
SJTC011488	APRIL 14 TCLP		0	0	0	0			0.00
SJSH042188	APRIL 21		0	0	0	0			0.00
SJTC042188	APRIL 21 TCLP		0	0	0	0			0.00
SRCD041488	APRIL 14 KILN SOLIDS		0	0	0	0			2.24 #
SJSH042888	APRIL 28 ASH DRAB		0	0	0	0			1.52 #
WCD041488	APRIL 14 A.D. WATER		0	0	0	0			0.00
FBCL041488	APRIL 14 FEEDSTOCK		0	0.0006	0.057	0			15958.60 #
SUSH051388-TC	CYCLONE DOWNCONNER		0	0	0	0			0.00
SJSH051388-TC	MAY 13		0	0	0	0			0.00
SRSH051388-TC	KILN SOLIDS MAY 13		0	0	0	0			0.00
SJQ042888-TC	APRIL 28 ASH DRAB		0	0	0	0			0.00
SRCD042188-TC	KILN SOLIDS APRIL 21		0	0	0	0			0.00
SRCD042888-TC	KILN SOLIDS APRIL 28		0	0	0	0			0.00
WCD00421TC-TC	A.D. WATER APRIL 21		0	0	0	0			0.00
WCD04288TC-TC	A.D. WATER APRIL 28		0	0	0	0			0.00
WCD04288TC-DUPLICATE			0	0	0	0			0.00
WCD051388-TC	A.D. WATER MAY 13		0	0	0	0			0.00

INDICATES 0.42 PPT
EXCEEDED

ATACHMENT 2

12-Jun-88

ATTACHMENT 1

VHS & OLM MODEL CALCULATIONS

THE FINAL VHS MODEL IS GIVEN BY:

$$C_y = C_o \operatorname{erf}(\sqrt{Y'/4Y}) \times \operatorname{erf}(X/[4(\sqrt{a'Y})])$$

WHERE:

$a' = 2$ METERS (FIXED)

$X = 283$ METERS (ASSUMED)

$Y = 500$ FT = 152.4 METERS (FIXED) DISTANCE TO COMPLIANCE POINT

$Y' = 12.2$ METERS (FIXED)

C_o = CONTAMINATE IN LEACHATE GIVEN BY OLM MODEL

C_y = CONTAMINATE CONCENTRATION AT COMPLIANCE POINT (mg/l)

erf indicates that the error function is applied

WHEN EVALUATED FOR THESE INPUT VALUES THE EQUATION REDUCES TO:

$$C_y = C_o \times 0.158$$

FOR ORGANICS, C_o IS GIVEN BY THE ORGANIC LEACHATE MODEL (OLM) AS:

$$C_o = 0.00211 (C_w^{.678}) (S^{.373})$$

WHERE:

C_w = THE CONSTITUANT CONCENTRATION IN THE WASTE

S = THE SOLUBILITY OF THE COMPONENT IN QUESTION

THE ^ SYMBOL INDICATES "RAISE TO THE POWER" I.E., $2^3=8$

THEREFORE, THE COMBINING THE VHS AND THE OLM MODELS GIVES:

$$C_y = (0.00211 (C_w^{.678}) (S^{.373})) (0.158)$$

COMBINING TERMS THIS REDUCES TO:

$$C_y = (0.00033338 (C_w^{.678}) (S^{.373}))$$

SOLVING THIS EQUATION FOR C_w ONE OBTAINS:

$$C_w = (C_y / [0.00033338 (S^{.373})])^{1.47492}$$

IF ONE ASSUMES THAT C_y = THE DRINKING WATER STANDARD OF 2×10^{-10} PPM

i.e., 0.2 ppq ,AND THAT THE SOLUBILITY IS 8 PPT, THEN:

SOLUBILITY PPT	SOLUBILITY PPM	C_y PPT	C_y PPM	C_w (CALCULATED) PPM	C_w (CALCULATED) PPT
8	8.00E-06	0.0002	2.00E-10	4.219E-07	0.42187920

THIS MEANS THAT OUR MAGIC NUMBER FOR DELISTABILITY
OF DIOXIN IS: 0.42187920 PPT

Table 1

MDLs for 2,3,7,8-TCDD

<u>Laboratory</u>	<u>Conc., ppt^a</u> <u>(10.0 g of Soil/Ash)</u>	<u>Conc., ppq</u> <u>(1.0 L of Water)</u>	<u>See</u> <u>Note</u>
Region 7	0.5	5	1
Region 7	10	100	2
EMSL-RTP	1.0 to 5	10 to 40	3
EMSL-LV	2.0	20	4
EMSL-LV	2.5	25	5
ERL-Duluth	No data	0.2 to 29	6
Overall	<u>≤ 5</u>	<u>≤ 40</u>	

Notes:

1. Based on results of numerous trial burns. Results are limited by the presence of 2,3,7,8-TCDD in the EPA spiking solutions.
2. Also based on results of numerous trial burns, but taking into account varying levels of dioxin concentration in the samples, matrix interference, glassware background, and other variables.
3. Based on results from soil samples collected throughout the United States, ash samples from various types of combustion/incineration processes, and water samples from ambient sources, point source dischargers, and scrubbers. Environmental/background contamination of hepta and octa CDDs and tetra and penta CDFs determines the lowest level that can be achieved.
4. Values represent the best case using Method 2,3,7,8-HRMS for water and soil/sediment matrices.
5. Values represent the best case using Method 8290 on a wide variety of water sources and a number of soil/ash-type matrices.
6. Based on 23 water samples ranging from blanks to industrial effluents.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL MONITORING AND SUPPORT LABORATORY
CINCINNATI, OH 45260

DEC 10 1987

DATE: December 3, 1987

SUBJECT: Recommended Reporting Levels for Chlorinated Dioxin Homologs

FROM: Robert L. Booth, Director
Environmental Monitoring and Support
Laboratory - Cincinnati

TO: Suzanne Rudzinski, Chief
Assistance Branch
Permits and State Programs Division
Office of Solid Waste (WH-563)

In response to the environmental monitoring techniques related to the storage/disposal of 2,4,5-T and Silvex, the Office of Research and Development has brought together the Agency's analytical expertise in GC/MS analyses using high resolution techniques and determined that the practical working levels for dioxin measurements are:

<u>Media</u>	<u>Sample Size</u>	<u>Practical Working Level*</u>
Water/Quench Water	1.0 L	> 100 ppq
Soil/Ash	10.0 g	> 10 ppt

*Equivalent to Practical Quantitation Level (see page 4)

They were able to reach a clear consensus of opinion on what important variables needed to be considered and have made the following recommendations:

Method of Choice: Method 8290, which represents the present state-of-the-art in HRGC/HRMS, and is being added to SW-846 by the EMSL-LV Laboratory/Office of Solid Waste. This method measures all tetra through octa chlorinated dioxins and furans present in a sample, and allows calculation of the 2,3,7,8-TCDD toxicity equivalent. Essentially, it is an updated version of what has been used by Region 7 and other EPA and contract laboratories in the measurement of dioxin contaminated samples of soil and water.

Quality Control Requirements: Method 8290 has a separate section that clearly specifies what quality control steps must be followed. Any referee analyses and evaluation of performance evaluation results required as part of the preliminary production runs and subsequent burns can be provided by Region 7 and EMSL-LV, respectively.

Contractor Lab Capabilities: There are approximately five to seven laboratories equipped with high resolution instrumentation in the United States that would be potentially available for specialized analytical services. Cost estimates are approximately \$2000/sample with a turn around time of five to ten days.

Method Detection Limit: This concentration represents the lowest achievable level under ideal laboratory conditions. Agency data have been reviewed that represent analyses of samples collected from a wide variety of sample matrices over an extended period of two to three years. Because of the strong QA/QC program practiced by the laboratories, individual single laboratory/single operator data were available for review. Results are summarized in Table 1.

12/4/87
45

Overall, if the MDLs for the high sample concentration levels were excluded (see Note 2 in Table 1), the collective experiences of the four laboratories would provide a consensus MDL of ≤ 5 ppt for soil/ash and ≤ 40 ppq for water/quench water. However, the reporting levels for chlorinated dioxin homologs cannot be based on MDL values for the following reasons:

- o If true sample concentrations are equal to the MDL, analytical results will not be quantitative, i.e., will be "less than MDL", on about 50% of all analyses. This would result in a significant number of false positives that could not be quantitated.
- o The Agency should not attempt to regulate at levels so low that quantitative analytical results cannot be expected with a reasonably high probability, i.e., at least 99% of the time.
- o Accordingly, higher levels must be used to provide reliable results.

Instead, key factors such as variable background levels, matrix interference, operator dependency, variabilities in instrument performance, and degrees of day-to-day quality control practiced must be considered because:

- o The MDL depends on many variables of the analytical system and of the sample being analyzed. The maximum MDL expected during enforcement of a regulation should make a reasonable allowance for the effect of normal analytical and sample conditions.
- o However, most MDL values represent "ideal" conditions, i.e., background levels are at an absolute minimum, matrix interference is not a problem, the best operator is used to develop the data base, the instrument has been fine-tuned to peak performance, and all other variables have been reduced to constants through rigid quality control procedures.
- o In actual practice, these ideal conditions are not achieved, and the laboratory results cannot be reliably interpreted as being different from zero. As a result, because of variability introduced by these key factors, a level must be selected that will properly reflect all the uncertainty appropriate to normal sample and analytical conditions.
- o Thus a practical quantitation level (PQL) must be recognized that accounts for these key variables and provides reliable quantitative analytical results that provide a proper basis for making regulatory decisions.

ATTACHMENT 3

The TCDD equivalent is calculated by multiplying the concentration listed in Table 1 by the Toxicity Equivalence Factor listed in the January 4, 1988 Federal Register, page 38. Those factors are listed in the table below.

Sample SRC0041488, the April 14, kiln solids sample is used for this example.

Constituant	Concentration ppt	Equivalence Factor	Calculated TCDD Equivalence ppt
2378 TCDD	0	1.0	0.0
non 2378 TCDD	0	0.1	0.0
PeCDD	0	0.5	0.0
HxCDD	56	0.04	2.24
2378 TCDF	0	0.1	0.0
non 2378 TCDF	0	0.001	0.0
PeCDD	0	0.1	0.0
HxCDF	0	0.01	0.0
total			2.24 ppt

The non-2378 TCDD is calculated by subtracting the 2378 TCDD from the total TCDD. In this example, there were no 2378 or other tetra dioxins measured. This technique is also applied to the tetra furans.

Practical Quantitation Level (PQL): Normally, the scientific community estimates this PQL as being anywhere from three to ten times the MDL. As discussed above, experience on real world samples has shown that the MDL established for a particular method by a qualified operator in a well-run laboratory must be multiplied by some factor to provide reliable data with usable precision and accuracy. This will provide a level that is a valid measure of what should be routinely achievable by qualified contract laboratory personnel. It represents the lowest level for which quantitative data are achieved during routine laboratory operations, providing results that can be reliably interpreted as different from zero.

Since only highly qualified operators/laboratories will be used for the high resolution analyses and it is desirable from a potential health/risk assessment to select the lowest limits that provide usable data, the lower limit of the range (i.e., ~ 3) can be applied. The Agency has taken a similar position through proposed rulemaking published in the Federal Register, Vol. 50, No. 219, Wednesday, November 13, 1985, for setting PQLs for volatile organic contaminants found in drinking water supplies. It has also made use of this approach in OSW's Methods 8240 and 8270 for the GC/MS measurement of organic compounds.

Reporting Levels: Documented data from EPA laboratories on real world samples of soil/ash and water/quench water support the position that the PQLs that should be routinely achievable by qualified contract laboratory personnel are ≥ 10 ppt in soil/ash and ≥ 100 ppq in water/quench water. They are not comparable to the detection limits stated in the literature. They take into account background levels, matrix interference, operator dependency, and are high enough that analytical results "less than detection limits" should not occur frequently. They represent single laboratory/single operator data on real world samples from the above EPA laboratories. Use of these PQLs will provide values that are reliable and have relatively good certainty that the results may be used in decision-making situations requiring results of a known/high quality.

I trust this will meet your needs. Please call me on FTS 684-7301 if you have any questions or need additional information.

cc: Erich Bretthauer
Courtney Riordan
Matt Bills
John Skinner
Fred Lindsey
Tom Hauser
Paul Britton
Ron Mitchum
Bob Kloepper
Doug Kuehl
Bob Harless